TO2260 0272660

FIGURE 1

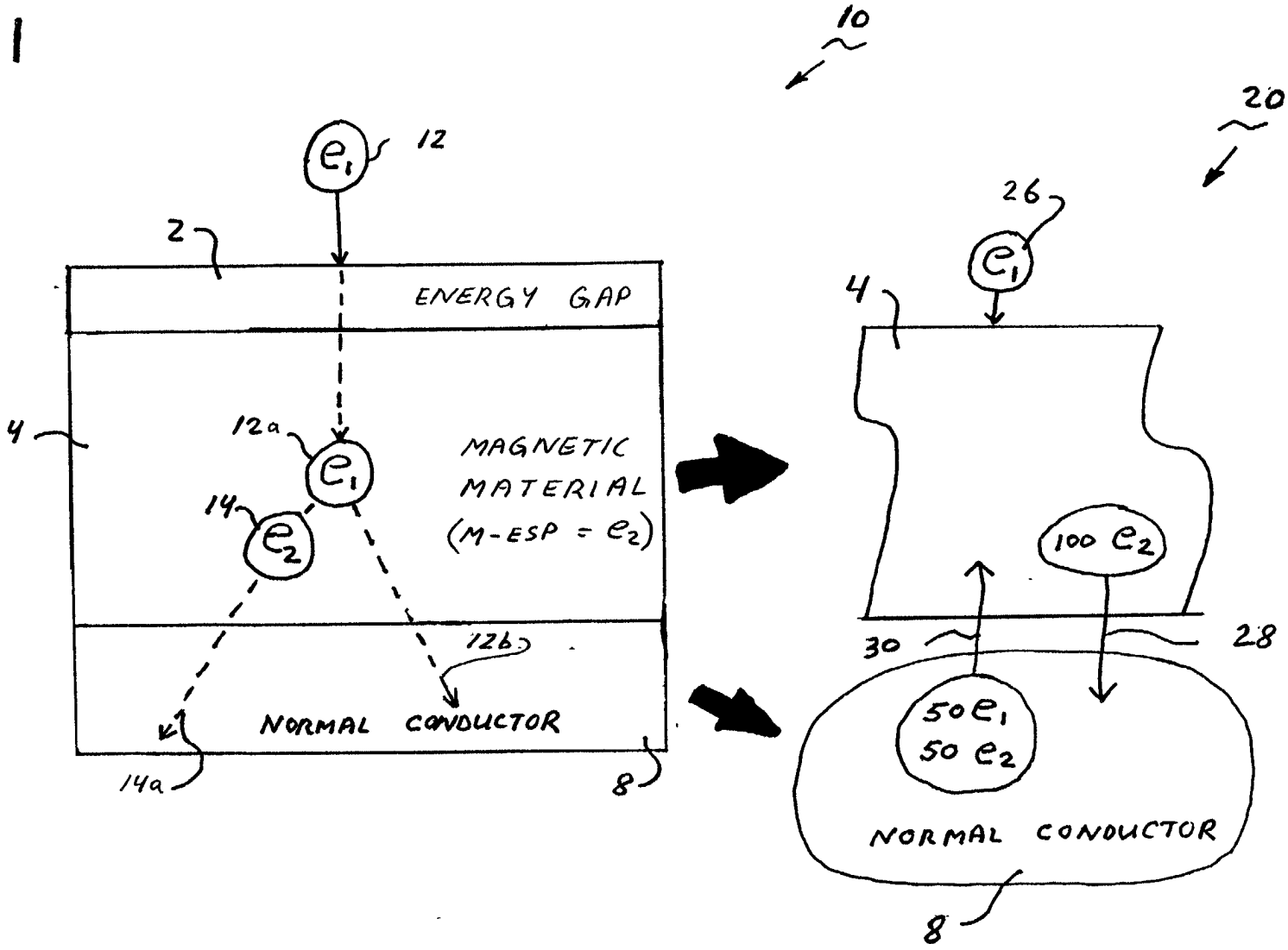


FIGURE 1B

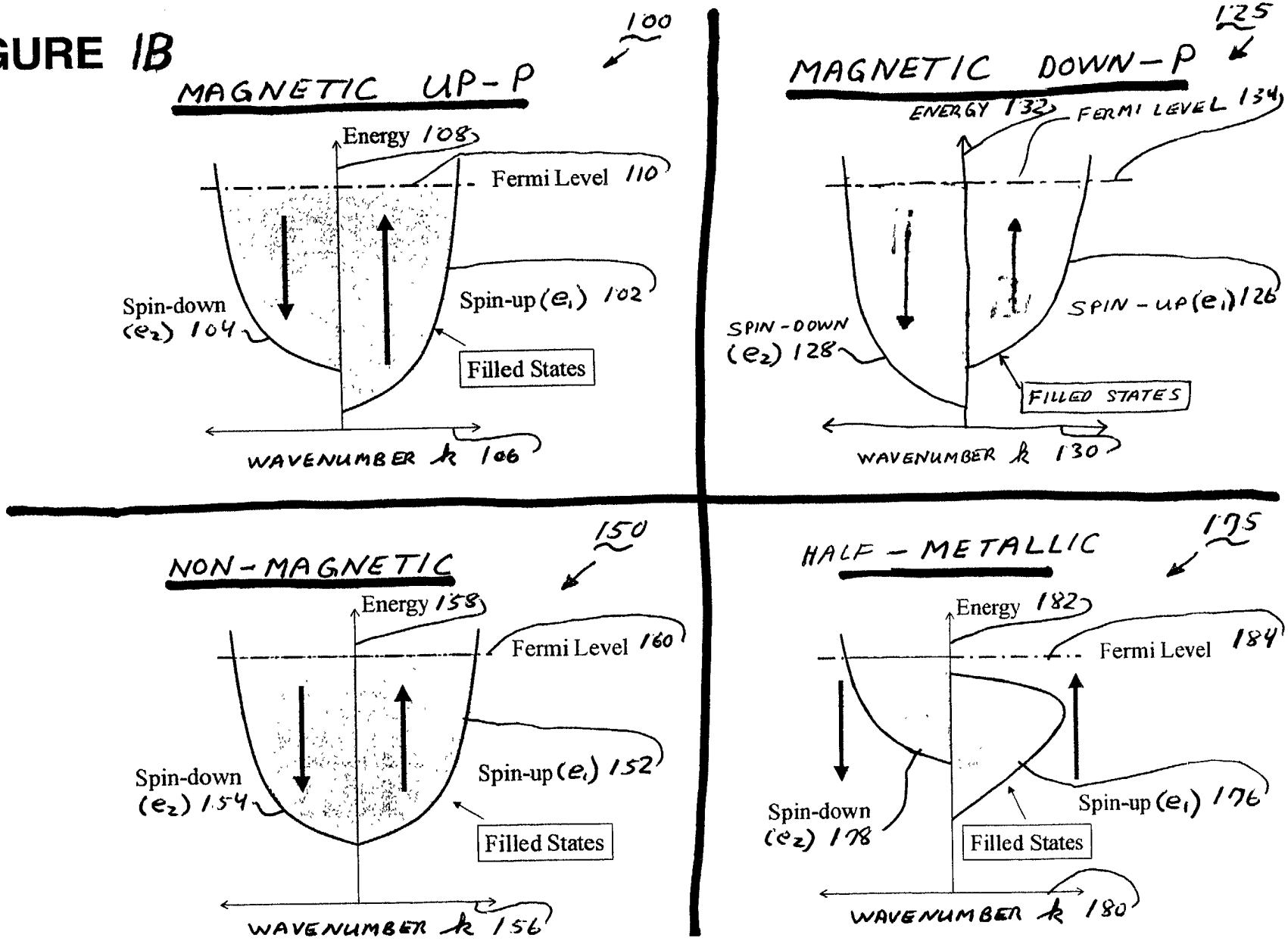
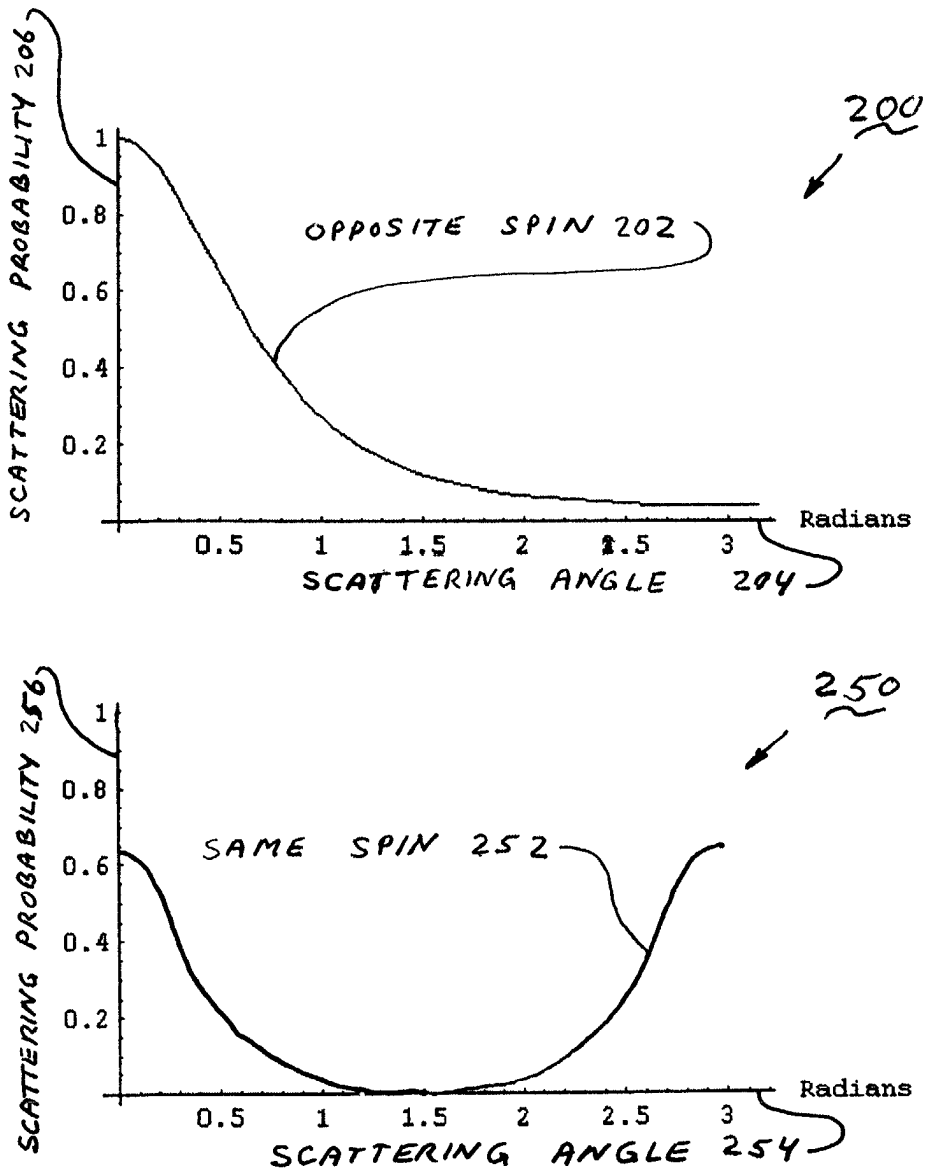

100
MAGNETIC UP-P
Energy 108
Fermi Level 110
Spin-down (e2) 104
Spin-up (e1) 102
Filled States
WAVENUMBER k 106
125
MAGNETIC DOWN-P
ENERGY 132
FERMI LEVEL 134
SPIN-DOWN (e2) 128
SPIN-UP (e1) 126
FILLED STATES
WAVENUMBER k 130
150
NON-MAGNETIC
Energy 158
Fermi Level 160
Spin-down (e2) 154
Spin-up (e1) 152
Filled States
WAVENUMBER k 156
175
HALF-METALLIC
Energy 182
Fermi Level 184
Spin-down (e2) 178
Spin-up (e1) 176
Filled States
WAVENUMBER k 180

FIGURE 2


200
OPPOSITE SPIN 202
SCATTERING PROBABILITY 206
1
0.8
0.6
0.4
0.2
0.5
1
1.5
2
2.5
3
Radians
SCATTERING ANGLE 204
250
SAME SPIN 252
SCATTERING PROBABILITY 256
1
0.8
0.6
0.4
0.2
0.5
1
1.5
2
2.5
3
Radians
SCATTERING ANGLE 254

TO2260 02T29660

FIGURE 3

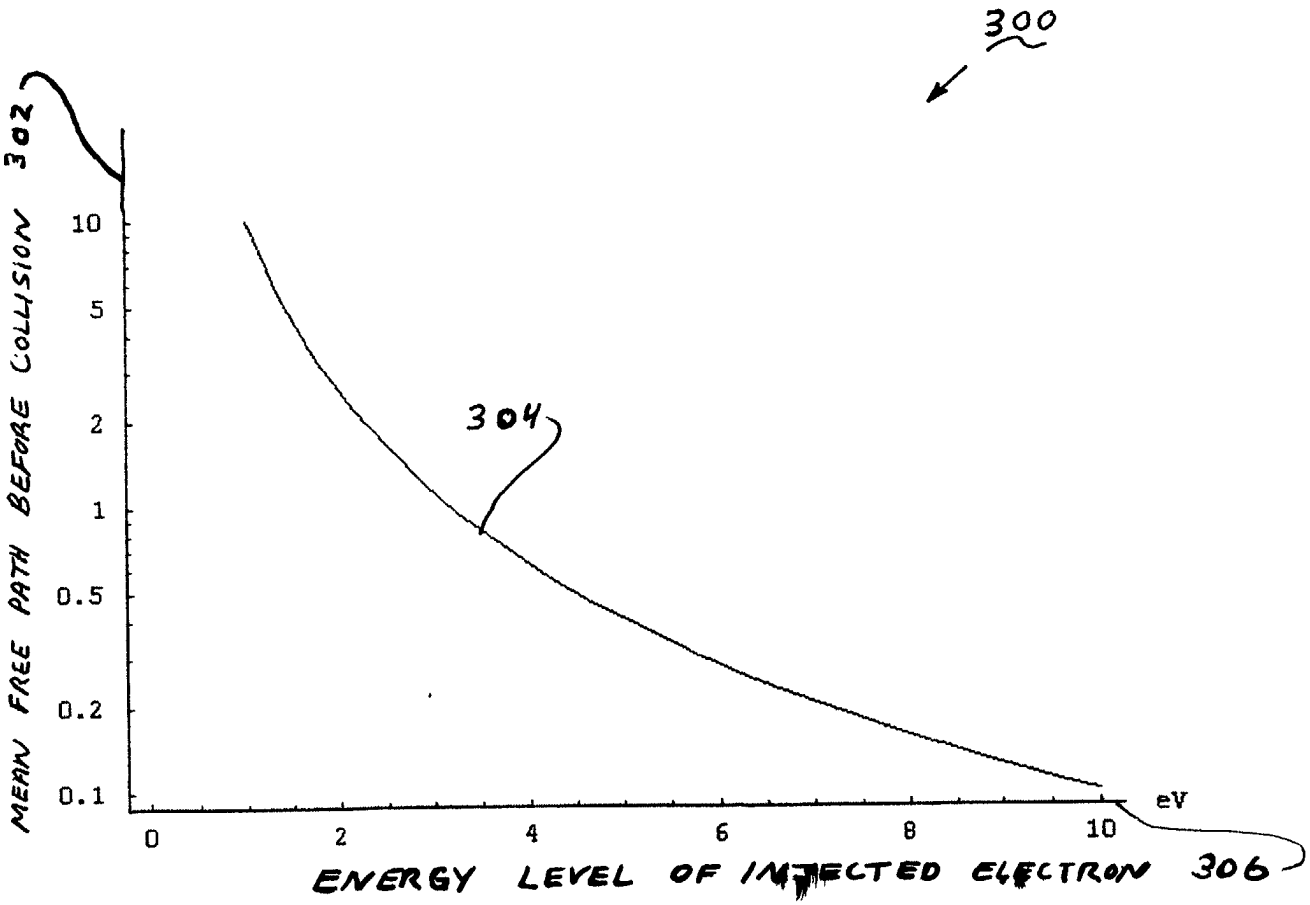
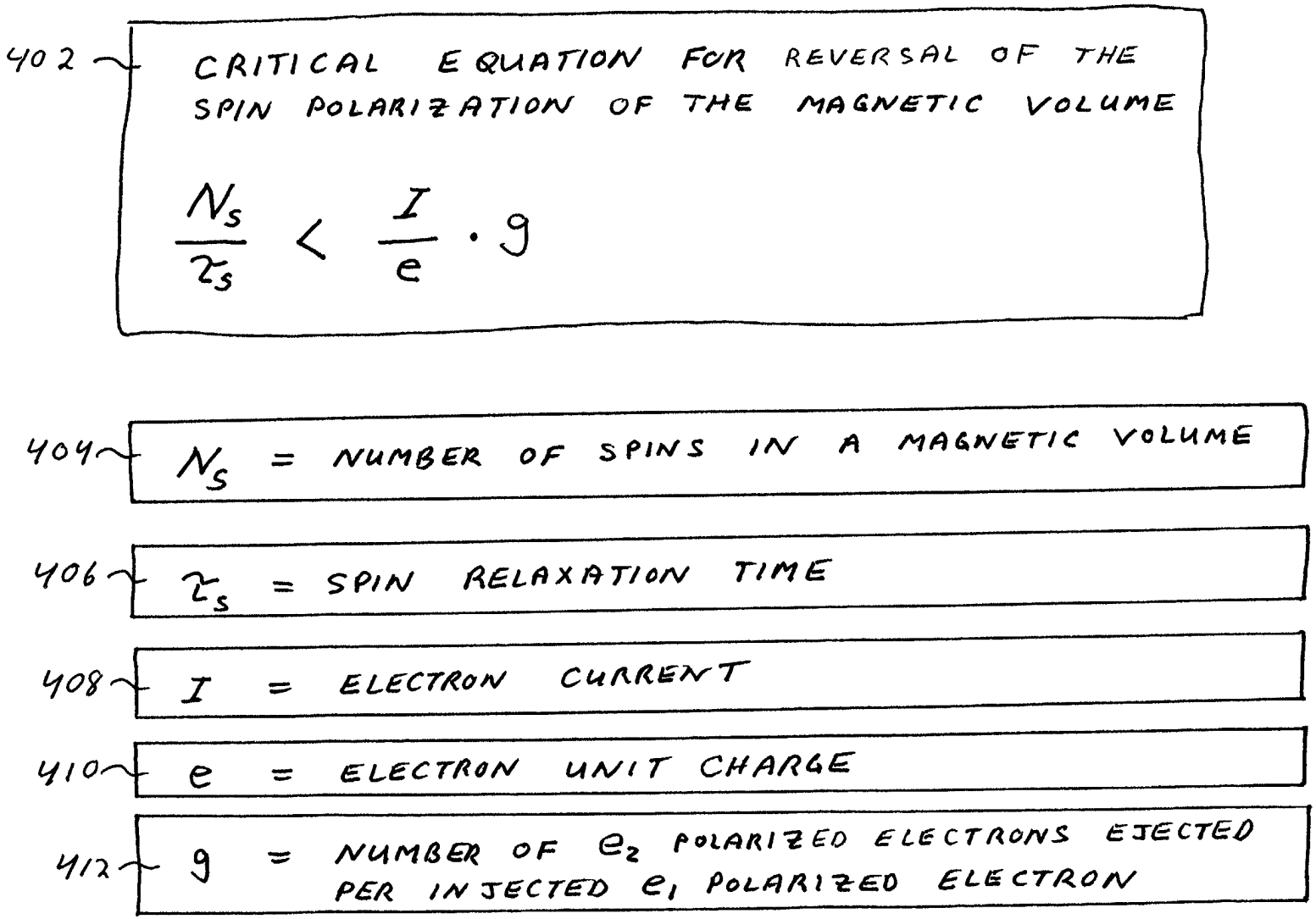


FIGURE 4


402
CRITICAL EQUATION FOR REVERSAL OF THE SPIN POLARIZATION OF THE MAGNETIC VOLUME
$\frac{N_s}{\tau_s} < \frac{I}{e} \cdot g$
404
N_s = NUMBER OF SPINS IN A MAGNETIC VOLUME
406
τ_s = SPIN RELAXATION TIME
408
I = ELECTRON CURRENT
410
e = ELECTRON UNIT CHARGE
412
g = NUMBER OF e_2 POLARIZED ELECTRONS EJECTED PER INJECTED e_1 POLARIZED ELECTRON

T0C260 0C7C9660

FIGURE 5

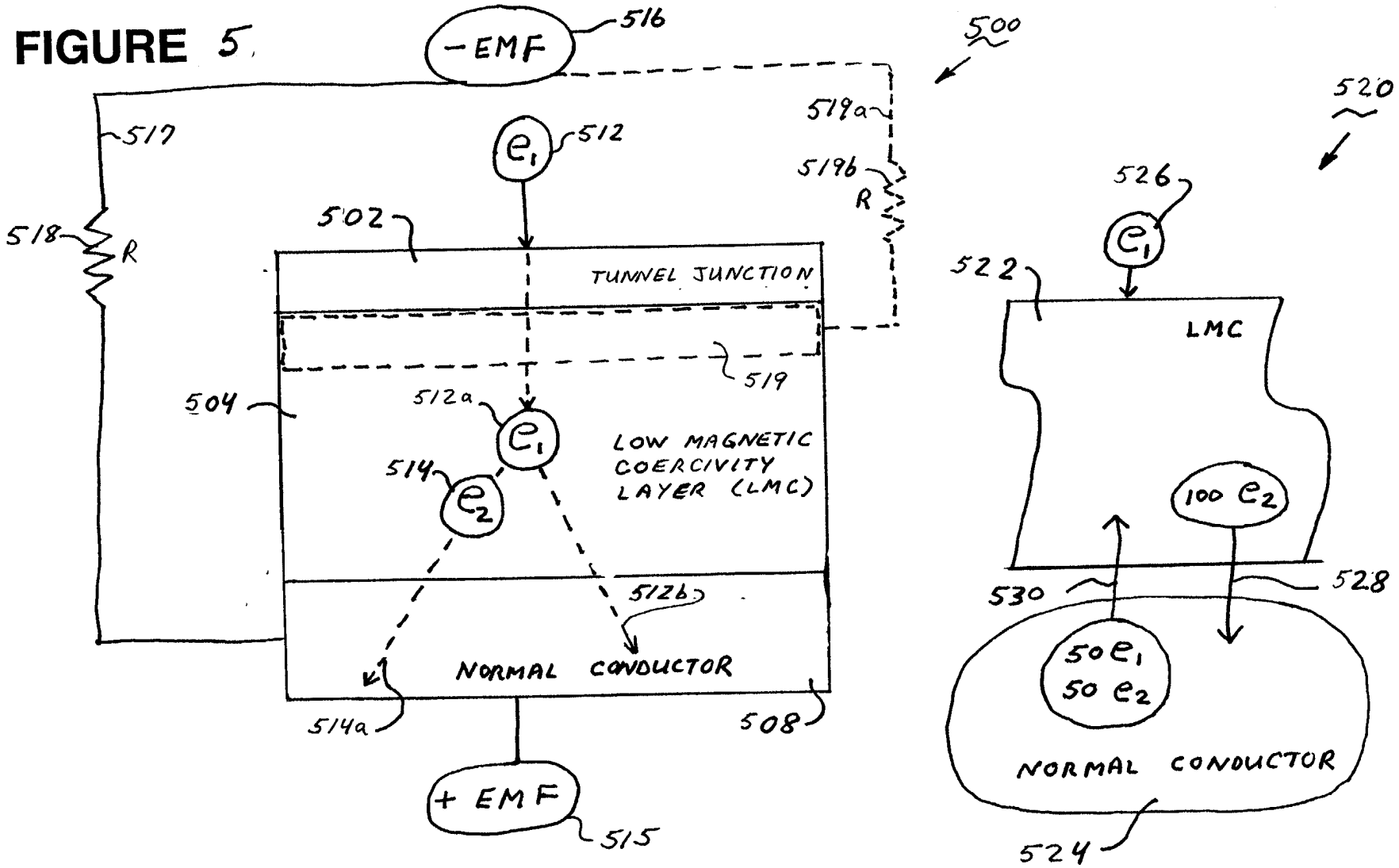
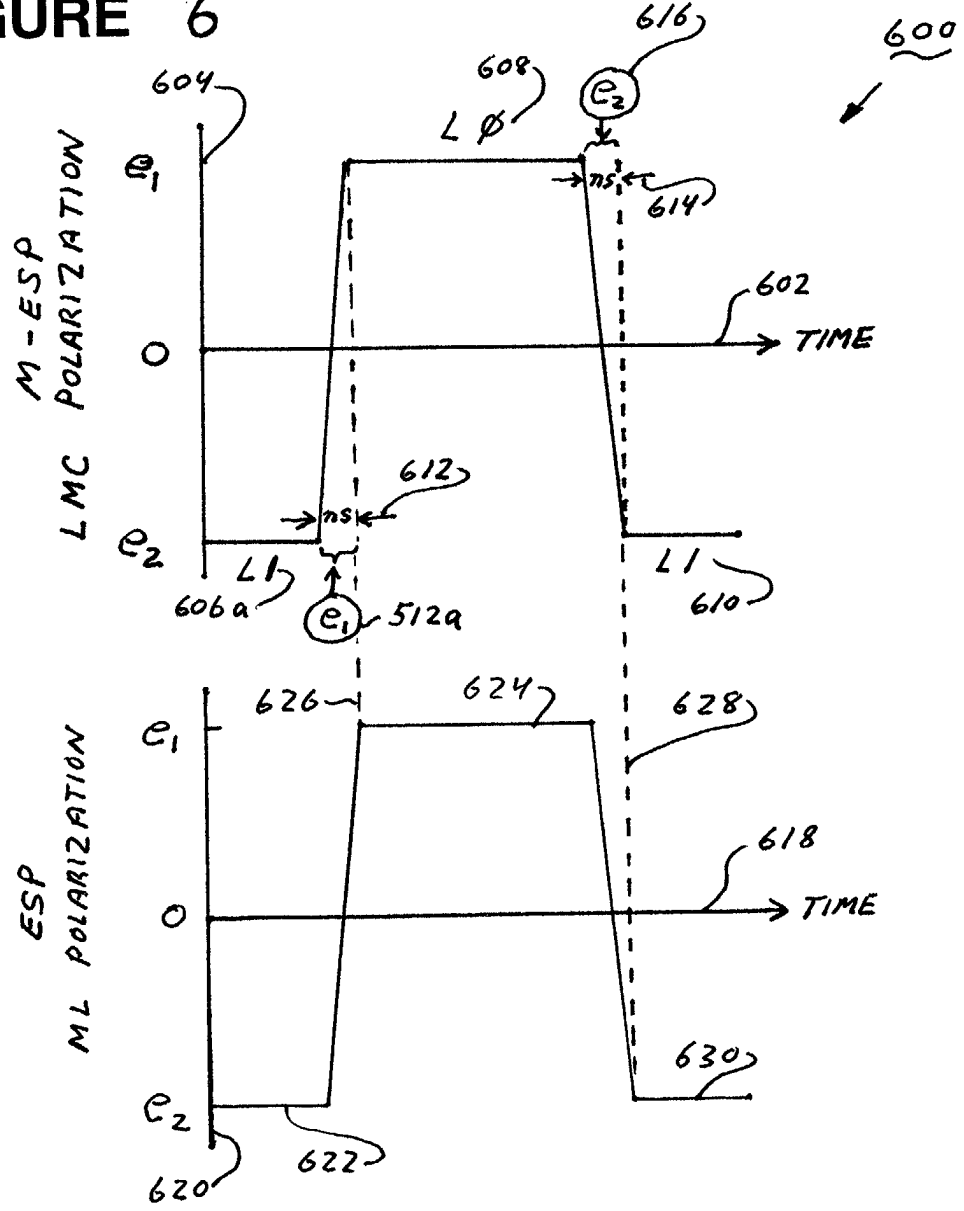
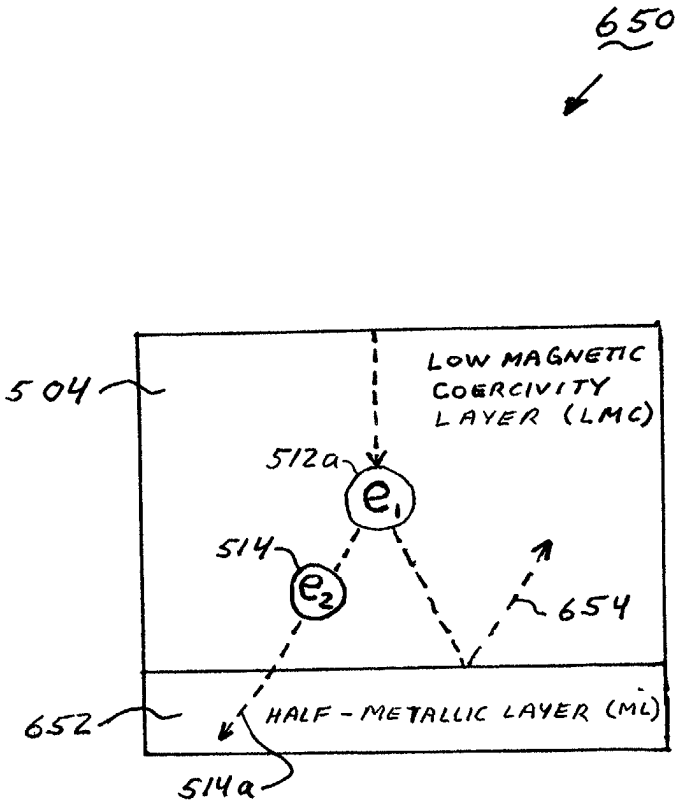


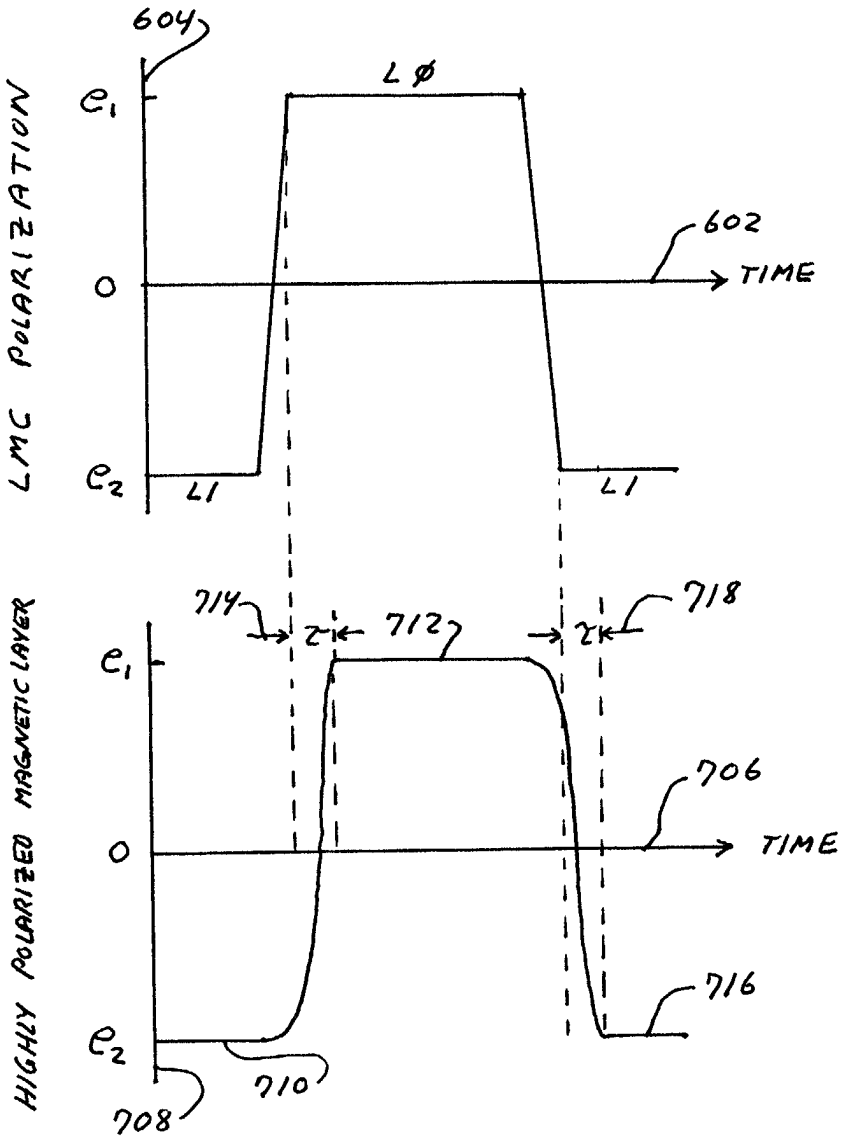
FIGURE 6


600
604
608
616
e_2
L Ø
e_1
ns_1
614
602
M-ESP
LMC POLARIZATION
0
TIME
612
ns
e_2
L1
606a
e_1
512a
L1
610
626
624
628
ESP
ML POLARIZATION
e_1
618
0
TIME
630
e_2
620
622


650
504
LOW MAGNETIC COERCIVITY LAYER (LMC)
512a
e_1
514
e_2
654
652
HALF-METALLIC LAYER (ML)
514a

TO2260 "0279660

FIGURE 7



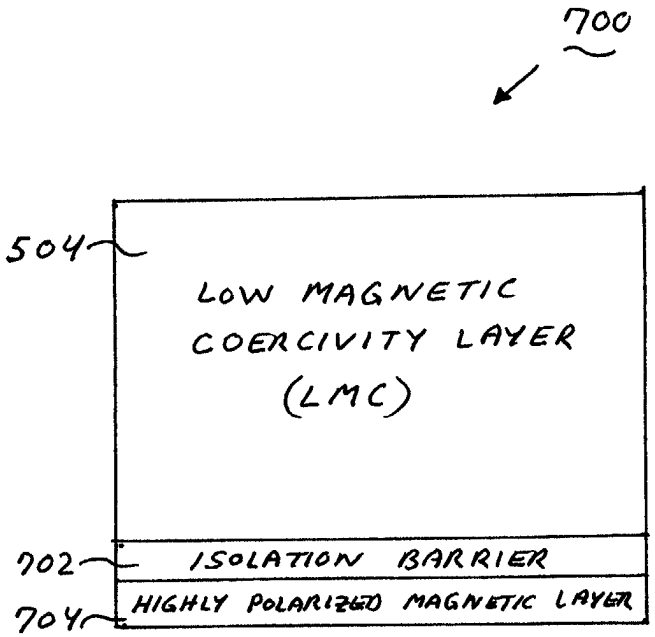
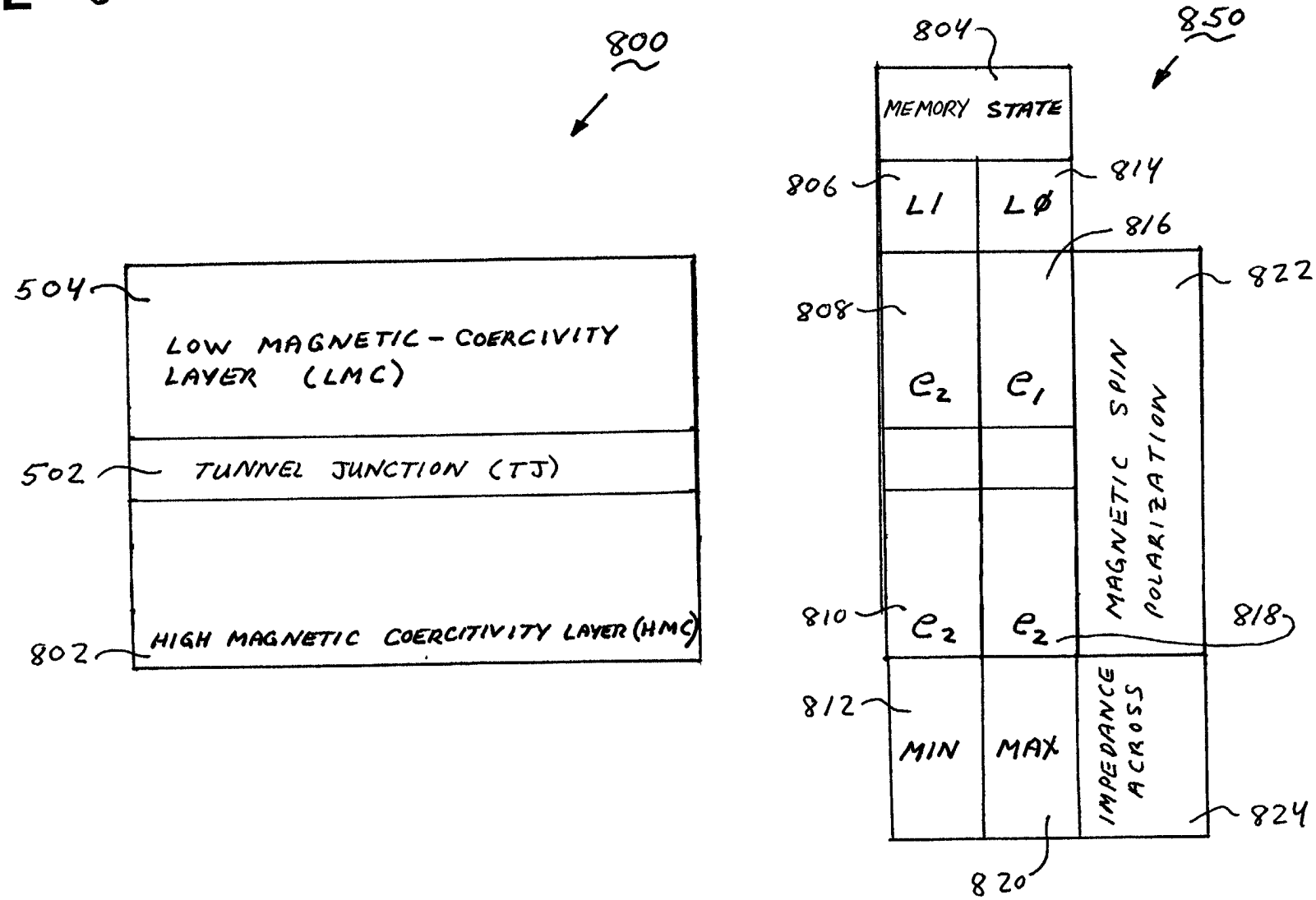


FIGURE 8


800
504
LOW MAGNETIC - COERCIVITY LAYER (LMC)
502
TUNNEL JUNCTION (TJ)
802
HIGH MAGNETIC COERCITIVITY LAYER (HMC)
850
804
MEMORY STATE
806
814
L1
LØ
816
822
808
MAGNETIC SPIN POLARIZATION
810
818
812
MIN
MAX
IMPEDANCE ACROSS
824
820

TO2260 "0270660

FIGURE 8B

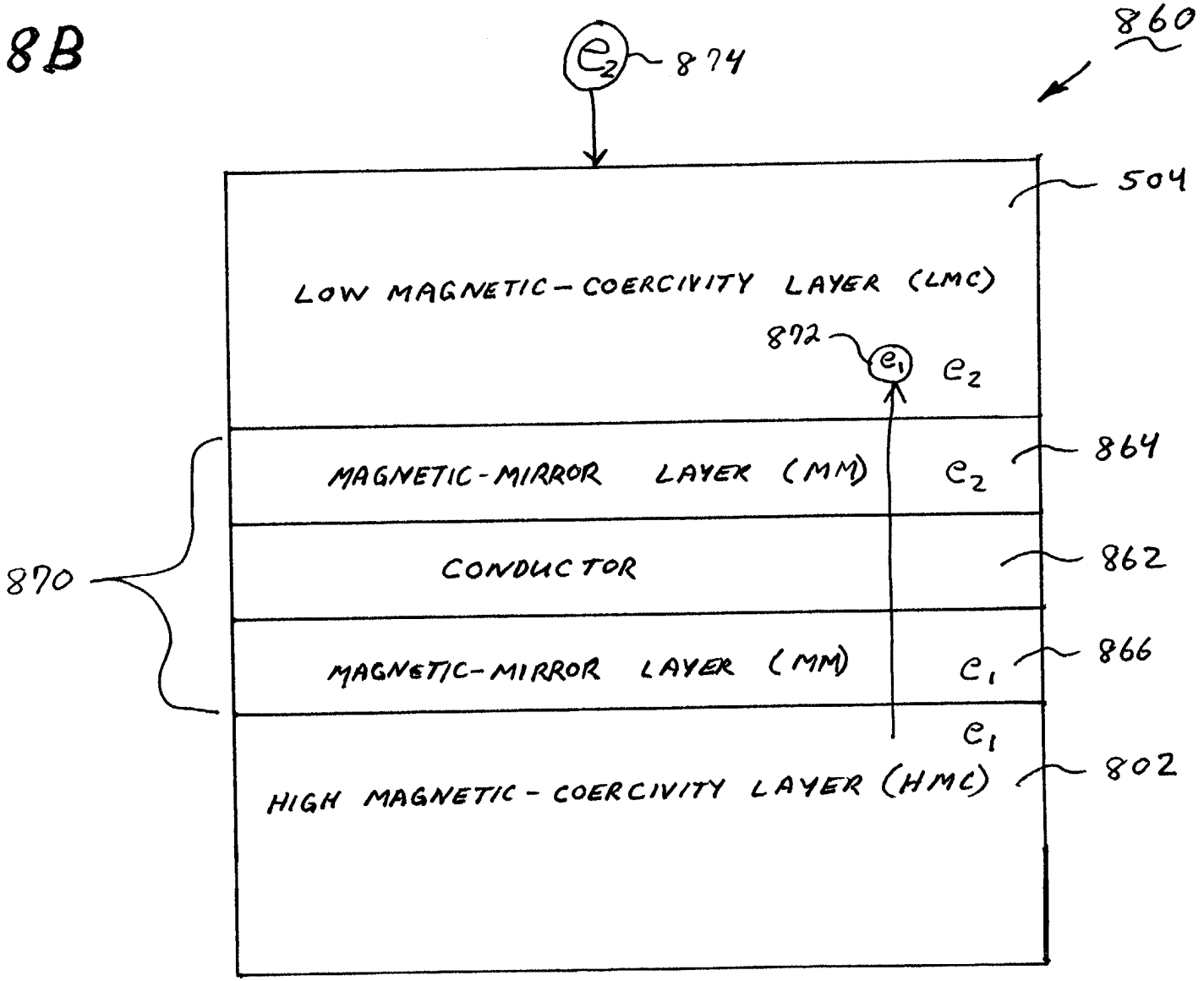


FIGURE 9

Application to VMRAM

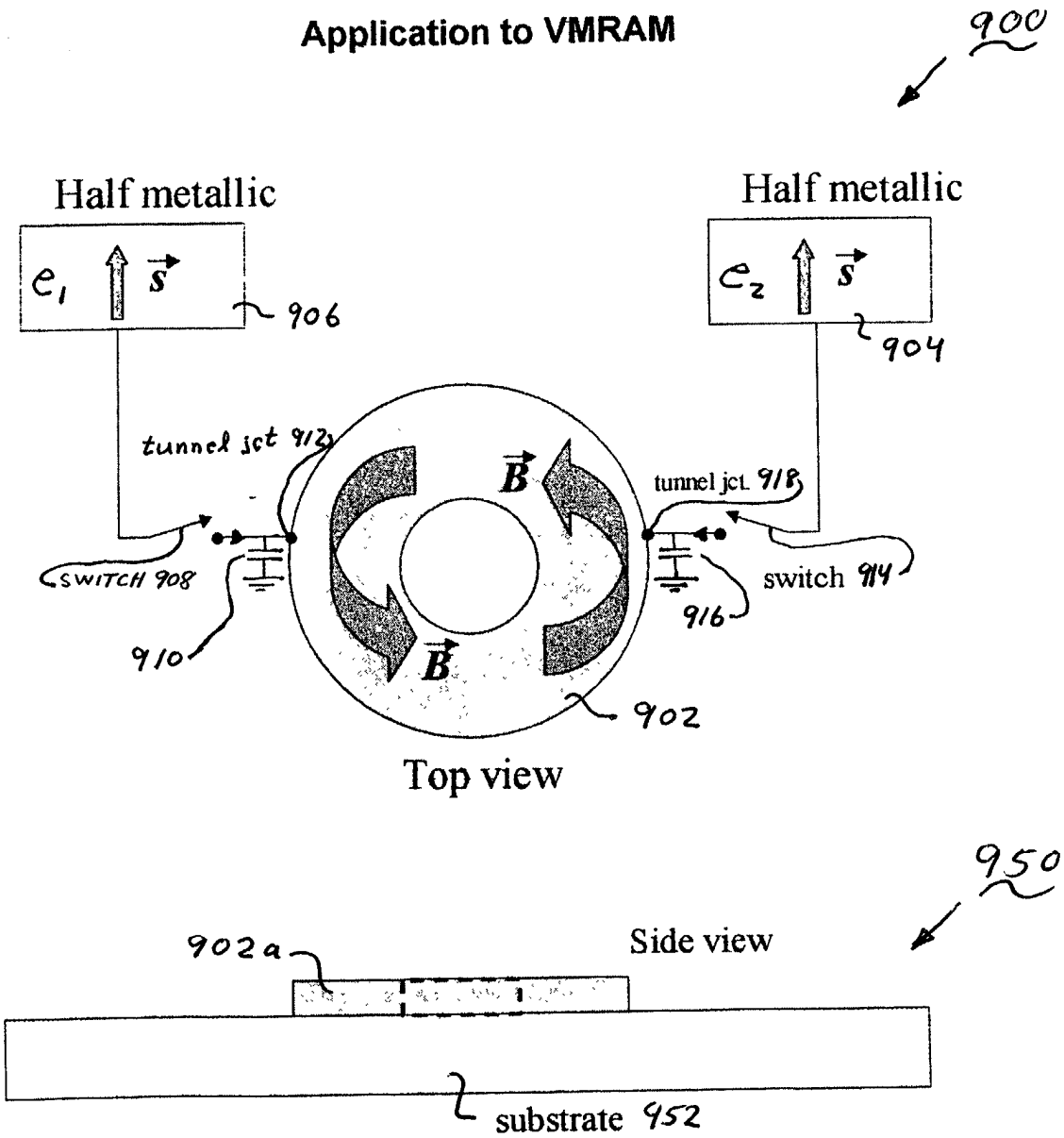
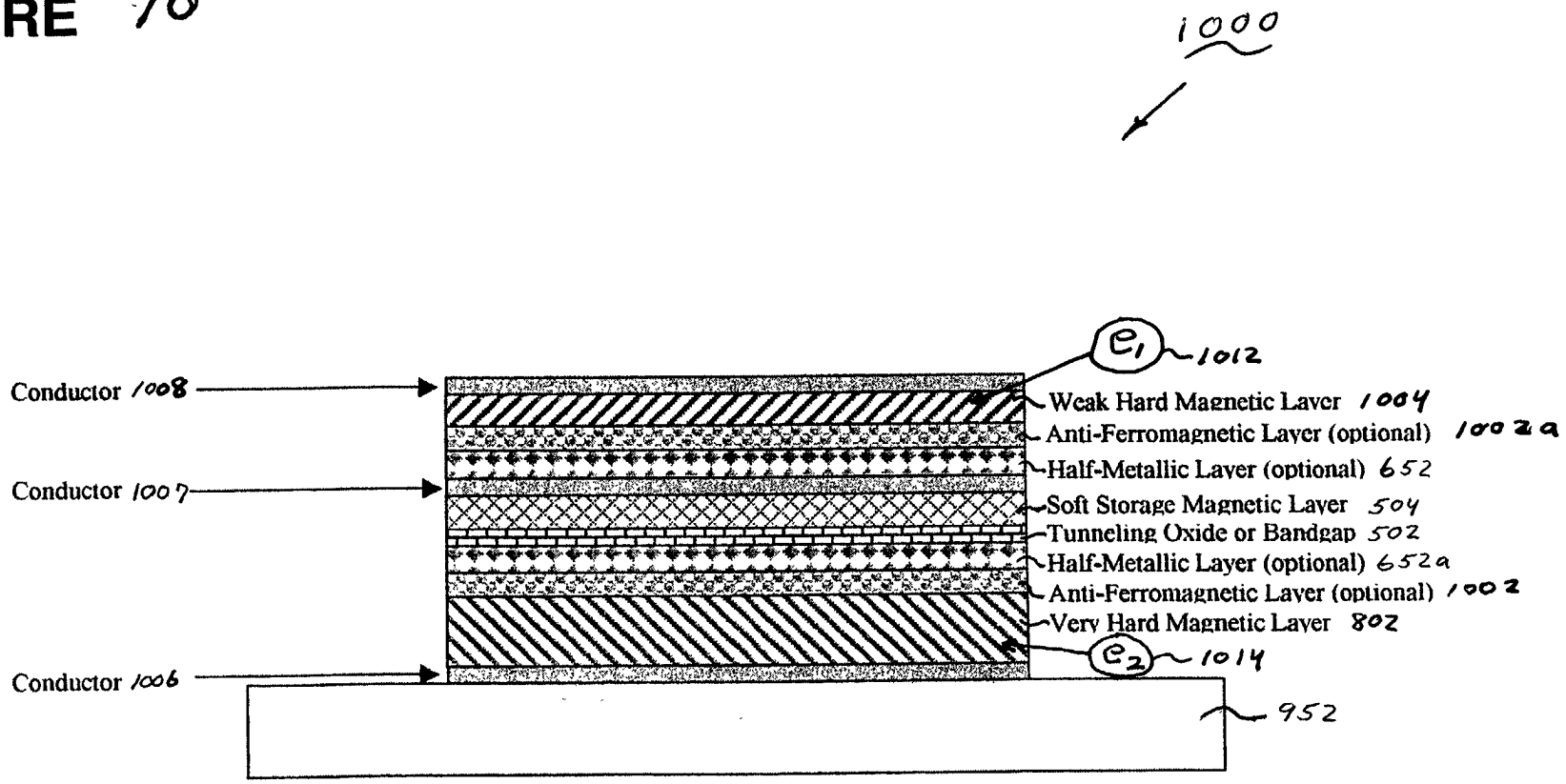


FIGURE 10


1000
e1
1012
Conductor 1008
Weak Hard Magnetic Layer 1004
Anti-Ferromagnetic Layer (optional) 1002a
Half-Metallic Layer (optional) 652
Conductor 1007
Soft Storage Magnetic Layer 504
Tunneling Oxide or Bandgap 502
Half-Metallic Layer (optional) 652a
Anti-Ferromagnetic Layer (optional) 1002
Very Hard Magnetic Layer 802
e2
1014
Conductor 1006
952